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| pact jpg1 | **Year 11 Mathematics: Applications**  **Investigation 4, 2015**  **Topic – Piecewise Linear Graphs**  **Take home component** | | | |  |
| **Important Information:**  *Although the take-home component is not worth any marks, it is essential in preparation for the in-class component. Knowledge and skills gained will be extended in the in-class validation component. This in-class validation will be completed under test conditions on the day in which this take-home component is due. The take-home component may be used when completing the in-class component. Contact may be made to parent(s) if the take-home component is not available for submission (at the start of the lesson).* | | | | | |
| **Date out:** | | *Week \_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_* | **Date Due:** | *Week \_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_* | |
| **Take home component weighting:** | | *0% of the year* | **In-class component weighting:** | *10% of the semester* | |
| **AIM:** *In this assessment, you will be investigating how to sketch piece-wise linear graphs, using technology when appropriate and the applications of this process.* | | | | | |

**The following table is the taxation rates for 2015–16 that apply from 1 July 2015.**

|  |  |
| --- | --- |
| **Taxable income** | **Tax on this income** |
| 0 – $18,200 | Nil |
| $18,201 – $37,000 | 19c for each $1 over $18,200 |
| $37,001 – $80,000 | $3,572 plus 32.5c for each $1 over $37,000 |
| $80,001 – $180,000 | $17,547 plus 37c for each $1 over $80,000 |
| $180,001 and over | $54,547 plus 45c for each $1 over $180,000 |

The above rates **do not** include the: Medicare levy of 2%, Temporary Budget Repair Levy; this levy is payable at a rate of 2% for taxable incomes over $180,000.

**Task 1]** Use **only** the tax table above to complete the following tables of values.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Income | 18 201 | 20 000 | 25 000 | 30 000 | 35 000 | 37 000 |
| Tax Payable in $ | 0.19 | 342 | 1292 | 2242 | 3192 | 3572 |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Income | 37 001 | 40 000 | 45 000 | 50 000 | 55 000 | 60 000 | 65 000 | 70 000 | 75 000 | 80 000 |
| Tax Payable in $ | 3572.33 | 4547 | 6172 | 7797 | 9422 | 11047 | 12672 | 14297 | 15922 | 17547 |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Income | 80 001 | 90 000 | 100 000 | 120 000 | 130 000 | 140 000 | 150 000 | 160 000 | 170 000 | 180 000 |
| Tax Payable in $ | 17547.37 | 21247 | 24947 | 32347 | 36047 | 39747 | 43447 | 47147 | 50847 | 54547 |

|  |  |  |  |
| --- | --- | --- | --- |
| Income | 180 001 | 190 000 | 200 000 |
| Tax Payable in $ | 54547.45 | 59047 | 63547 |

**Task 2]** Construct a piecewise **line graph** to represent the information contained within the tables of values in task 1, using “Tax Payable” as the y axis $2000 increments and “Taxable Income” in $10 000 increments as the x axis. (**HINT**: The x axis should go from 0 at the origin to at least 22 with each square representing $5000 to allow for all of the coordinates and the y axis from 0 at the origin to 60 with each line representing $2000.)

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Use the previous graph to answer the following questions;

**(a)** What is the gradient of the line between x = 1.82001 and x = 3.700 given that the gradient of a line is given by m = rise / run.

m = 0.19

**(b)** Using the gradient and one of the coordinates from the first table of values, construct an equation

(call it Eq 1.) for this line.

Recall that the equation of a line through two points is given by; y − y1 = m(x − x1)

\* can also substitute a point

m = 0.19

(20000, 342) 342 = 0.19(20000) + c c = -3458 y = 0.19x - 3458

**(c)** Repeat the process in (a) and (b) for the other 3 tables of values, to generate the equations Eq 2, Eq 3, for the other three line segments.

m = 17547 – 3572.33/80000 – 37001 = 0.325 (40000 , 4547) 4547 = 0.19(40000) + c c = -8453

**y = 0.325x - 8453**

m = 54547 – 17547.37/180000 – 80 001 = 0.37 (90000 , 21247) 4547 = 0.19(90000) + c c = -12053

**y = 0.37x – 12053**

m = 63547 – 54547.45/200000 – 180001 = 0.45 (200000,63547) 63547 = 0.45(200000) + c c =-26453

**y = 0.45x - 26453**

(d) You can combine the 5 line segments of this graph to produce a piecewise Linear Function F(x) using the four equations of each line segment. Fill in the missing information in the following to define F(x);

**F(x) = 0 if 0 < 1.821**

**Eq1. y = 0.19x - 3458 if 1.821< x < 3.701**

**Eq2. y = 0.325x - 8453 if 3.701< x < 8.0001**

**Eq3. y = 0.37x – 12053**  **if 8.0001< x < 18.0001**

**Eq4. y = 0.45x - 26453 if x > 18.0001**

**Task 3]**

1. Using your graph and the function F(x), calculate how much tax is payable for someone earning a taxable income of $48 000 pa.

x = 48 000

= 48 which is equation 2 **y = 0.325x - 8453**

= 7147

1. Given that the Medicare levy is 2% of your taxable income and that it is added on to your tax payable, what would be their total tax payable on the original taxable income of $48 000 ?

**Tax payable = $7147 + 0.02x 48 000**

**= $8107**

**~** End of Investigation**~**